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From an editorial in *The New York Times*, October 3, 1920, on James Russell Lowell as a teacher at Harvard, with special reference to an article on this topic by W. R. Thayer: "Mr. Thayer describes and seems to wonder at Mr. Lowell's illimitable mustaches—frowning over a square beard. They were a work of art, nor can we understand why Mr. Thayer found them 'neither becoming nor beautiful.' There were barbate giants in those days. One remembers Professor BENJAMIN PEIRCE and his son, Professor JAMES MILLS PEIRCE, bearded both like the pard or the ball players of the House of David. Mr. James T. Fields, one of Mr. Lowell's publishers and his successor as editor of *The Atlantic*, had as copious and melodious a beard as ever inflamed a barber's eyes; at one time there were strange sausages or curls each side of the cheek."

The Göttingen *Nachrichten*, Mathematisch-physikalische Klasse for June, 1920, contains the first of a series of memoirs by G. H. Hardy and J. E. Littlewood in which they propose to develop in detail the new analytic method which they found for the discussion of Waring's problem and a number of allied problems in 'additiver Zahlentheorie.' The general lines of this method, in so far as it concerns Waring's problem in particular were explained in a recent paper in the *Quarterly Journal of Mathematics* [see this MONTHLY, 1920, 272] where full references to the literature of the problem were given. The object of the authors now is "to give full details of the proofs, up to the point at which Hilbert's famous theorem, first proved in this journal in 1909, emerges as a corollary from our analysis." The Geschäftliche Mitteilungen of the *Nachrichten*, for July, 1920, contains sketches of the life and work of Woldemar Voigt [1920, 280], pages 45–52, by C. Runge, and of Adolf Hurwitz [1920, 191], pages 75–83, by D. Hilbert.

#### ARTICLES IN CURRENT PERIODICALS.

**AMERICAN JOURNAL OF MATHEMATICS**, volume 42, no. 3, July (published in October), 1920: "The failure of the Clifford chain" by W. B. Carver, 137–167; "On the representations of numbers as sums of 3, 5, 7, 9, 11 and 13 squares" by E. T. Bell, 168–188; "On a certain class of rational ruled surfaces" by A. Emch, 189–210.

**BULLETIN DES SCIENCES MATHÉMATIQUES**, volume 55, June, 1920: Review by R. Garnier of O. Veblen and J. W. Young's *Projective Geometry*, volume 2 (Boston, 1918), 105–112 [Last paragraph: "Par ce rapide aperçu on aura pu pressentir la variété des problèmes abordés, la rigueur des développements et l'importance des résultats établis. A ces qualités essentielles, le Traité joint tous les avantages d'une forme attrayante; rédigé dans un style clair et précis, complété par un choix très étendu d' 'exercices'—dont quelques-uns, d'un niveau élevé, sont empruntés à de récents Mémoires—, l'Ouvrage de MM. Veblen et Young sera pour l'étudiant français le plus sûr des initiateurs."]

**BULLETIN OF THE AMERICAN MATHEMATICAL SOCIETY**, volume 27, no. 1, October, 1920: "The Seattle meeting of the San Francisco section" by E. T. Bell, 1–4; "Note on a generalization of a theorem of Baire" by E. W. Chittenden, 5–6; "Certain iterative characteristics of bilinear operations" by N. Wiener, 6–10; "Necessary and sufficient conditions that a linear transformation be completely continuous" by C. A. Fischer, 10–17; "On the relation of the roots and poles of a rational function to the roots of its derivative" by B. Z. Linfield, 17–21; "Moritz Cantor, the historian of mathematics" by F. Cajori, 21–28; "Shorter notices," 28–38 [Reviews by D. E. Smith of A. Eymieu's *La Part des Croyants dans les Progrès de la Science au XIX<sup>e</sup> Siècle*, 3e éd. (Paris, 1920) and of J. M. Child's *Early Mathematical Manuscripts of Leibniz* (Chicago, 1920); reviews by R. D. Carmichael of A. N. Whitehead's *An Enquiry Concerning the Principles of Natural Knowledge* (Cambridge, 1919) and of H. Bateman's *Differential Equations* (London, 1918)]; "Notes," 39–46; "New publications," 46–48.

**MATHEMATICAL GAZETTE**, volume 10, July, 1920: "The Leeds meeting" by R. C. Fawdry, 81-82; "The training of the mathematical teacher" by W. P. Milne, 83-85; "The mathematics of thread and cloth construction: an historical survey" by A. F. Barker, 86-91; "The mathematical theory of the sateen arrangement" by S. A. Shorter, 92-97; "The teaching of mathematics to textile students" by J. H. Whitwam, 98-102; "On the teaching and applications of dynamics" by A. Gray, 103-114; "Mathematics and commerce" by A. N. Shimmin, 115-118; "Life of James Stirling, the Venetian" by C. Tweedie, 119-128.

**MESSENGER OF MATHEMATICS**, volume 49, nos. 7, 8, November, December, 1919: "The tetrahedron and pentaspherical coördinates" by T. C. Lewis, 97-106; "Two trigonometrical determinants" by E. H. Neville, 107-111; "The dissection of rectilineal figures" (concluded) by W. H. Macaulay, 111-121; "On Laplace's integrals for a Legendre polynomial" by S. Pollard, 121-125; "A form for  $(d/dn)P_n(\mu)$ , where  $P_n(\mu)$  is the Legendre polynomial of degree  $n$ " by A. E. Jolliffe, 125-127; "On a property of algebraic numbers" by W. Burnside, 127-128—January, February, March, 1920: "On plane curves of degree  $n$  with tangents of  $n$ -point contact" by H. Hilton, 129-134; "An integral equation occurring in a mathematical theory of retail trade" by H. Bateman, 134-137 [First two paragraphs: "A tradesman, who buys and sells various articles, will be supposed to have worked up his business to such an extent that he can be sure of selling his goods at a constant rate so that a new supply of any article will be completely exhausted at the end of an interval of time  $T$  after the date of purchase.<sup>1</sup> Our problem is to find the law according to which goods must be purchased in order that the total value of the stock may remain constant.

"To simplify matters the process of buying and selling will be treated as continuous instead of discontinuous. This is approximately true if business is brisk all the time and if the working hours and days are pieced together so that 'business time' can be treated as a continuous variable."]; "On apolar and co-apolar triangles for a cubic, and on apolarly conjugate triangles" by E. R. Elliott, 137-149; "Notes on some points in the integral calculus" (liii) by G. H. Hardy, 149-155; "Four-vector algebra and analysis" by C. E. Weatherburn, 155-176—April: "On the congruence  $(p-1)! \equiv -1 \pmod{p^2}$ " by N. G. W. H. Beeger, 177-178; "On Pascalian collinearities and concurrencies" by E. B. Elliott, 178-180; "Transitive constituents of the group of isomorphisms of any abelian group of order  $p^m$ " by G. A. Miller, 180-186; "Is there an analogue in solid geometry to Feuerbach's theorem?" by T. C. Lewis, 187-192 [A discussion of a problem proposed in J. L. Coolidge, *Treatise on the Circle and the Sphere*, p. 247; Mr. Lewis finds: "It is easy to prove that there is no analogue, in space of three dimensions, to Feuerbach's theorem, and it follows that there is nothing corresponding to the Hart systems"].

**THE MONIST**, volume 30, no. 3, July, 1920: "Space and time" by R. W. Sellars, 321-364; "Lord Rayleigh," 474-475.

**NATURE**, volume 105, July 29, 1920: "Tycho Brahe" by J. K. Fotheringham, 672-673 [Review of *Tychonis Brahe Dani Opera Omnia*, volume 6, Copenhagen, 1919].—August 5: "Relativity and reality" by R. A. Sampson, 708.—August 12: "Complex elements in geometry" by G. B. Mathews, 736-737 ["P.S.—Since the above was written, I have had time to reflect further upon Prof. Hatton's book, and I have read Prof. G. H. Hardy's review of it in a recent number of the *Mathematical Gazette*. I do not wholly agree with Prof. Hardy's attitude, because I still think that there are geometrical notions not reducible to arithmetic—still less to formal logic. But I do agree with him that Prof. Hatton's book has no theoretical value, and disagreeable as it is, I think it is my duty to say so, especially as I have been informed that another reviewer has praised the book in absurdly exaggerated terms. G.B.M." Cf. 1920, 268-269]; "Obituary, Professor John Perry, F.R.S.," by H.E.A. and W.E.D., 751-753; [Note], 762 ["News has just reached us that Prof. A. T. De Lury was appointed some months ago to be the head of the department of mathematics in the University of Toronto by the Board of Governors on the recommendation of the president of the University, Sir R. A. Falconer. The staff, council, and senate have nothing to do with appointments, and the only check upon the action of the president and the Board of Governors is public opinion. Prof. De Lury has been a member of the teaching staff of the University for many years, and is the author of a number of mathematical text-books which have done service in the schools of the province of Ontario. He possesses high teaching ability, but has not been associated with the research activities which it should be the essential

<sup>1</sup> "Strictly this should be the date at which the new supply is made available for sale. We shall suppose for simplicity that in the case of any special article the date at which the old supply is exhausted coincides approximately with the date when a new package is opened."

function of a university to create and foster. Without men engaged in the production of new knowledge the work of a university differs little from that of a secondary school preparing students for examinations. Toronto has won much distinction by the scientific investigations of such men as Profs. Maccallum, McLennan, and Brodie, and it was hoped that the chair of mathematics would have been filled by someone who possesses the highest research qualifications in mathematics that Canada could produce. If Prof. De Lury can and will build up a strong research staff under him, he will be doing the best service to his University and extend the stimulating atmosphere which some of his scientific colleagues have given to the institution by their work"].—August 19: "The mathematician as anatomist" by A. Keith, 767-770 [Review of two parts of K. Pearson's "A Study of the long bones of the English skeleton" Cambridge, 1919]; "Obituary, Sir Norman Lockyer," 781-784.—August 26: "Professor Alexander's Gifford Lectures" by Viscount Haldane, 798-801 [Review of S. Alexander's *Space, Time, and Deity*, 2 volumes, London, 1920]; "Use of Sumner lines in navigation" by J. Ball, 806-808; "Relativity and hyperbolic space" by A. McAulay, 808; "Sir Norman Lockyer's contributions to astrophysics," by A. Fowler, 831-833.—Volume 106, September 2: "Internal constitution of the stars" by A. S. Eddington, 14-20; "Memorial tributes to Sir Norman Lockyer," 20-25 [by various authors]—September 16: "Ewing's 'Thermodynamics'" by H.L.C., 72-73 [Review of J. A. Ewing's *Thermodynamics for Engineers*, Cambridge, 1920]; "Associated squares and derived squares of order 5" by J. C. Burnett, 79 [shows that there are nearly 700,000 such magic squares of the first 25 integers].

**LA NATURE**, volume 482, July 10, 1920: "La 'multi,' nouvelle machine à multiplier" by J. Boyer, 30-32—July 17: "L'heure exacte sans instruments et sans calculs" by Viguier, 43-45.

**NOUVELLES ANNALES DE MATHÉMATIQUES**, volume 79, May, 1920: "Sur l'application de la loi de Gauss à la position probable d'un point dans le plan ou dans l'espace" (continued) by J. Haag, 161-178; "Sur une propriété caractéristique des cylindres et du cylindroïde" by R. Harmegnies, 178-180; "Sur la surface dont tous les points sont des ombilics" by R. Harmegnies, 180-181; "Courbes gauches liées par échange des directions des tangentes et des binormales. Les formules de Frenet sont intuitives" by G. Fontené, 181-188; "Correspondance," "Chronique," "Solutions de questions proposées," "Questions," 188-200—June: "Sur l'application de la loi de Gauss à la position probable d'un point dans le plan ou dans l'espace" (concluded) by J. Haag, 201-208; "Sur un système remarquable de cinq droites" by R. Bricard, 209-214; "Rayon de courbure de la courbe qui est le lieu des centres des sphères osculatrices à une courbe gauche" by G. Fontené, 214-219; "Chronique," "Certificats d'analyse supérieure," "Solutions de questions proposées," "Questions," 220-240—July: "Sur un défaut de la méthode d'interpolation par les polynômes de Lagrange" by M. Fréchet, 241-249; "Transformation polaire interaxiale" by M. D'Ocagne, 248-260; "Agrégation des sciences mathématiques (juillet, 1919): Problème de calcul différentiel et intégral, et composition de calcul différentiel et intégral" by R. Garnier, 260-275; "Chronique" and "Questions," 275-280—August: "Surfaces de translation applicables l'une sur l'autre" by B. Gambier, 281-295; "Notes sur les congruences de normales" by M. Bayard, 295-297; "Concours spécial d'agrégation de 1919. Solution du problème de mécanique" by E. Delassus, 297-307; "Certificat de géométrie supérieure, Paris, 1919," 307-311; "Certificat de mécanique appliquée, Lille, 1919," 314-316; "Concours d'admission à l'Ecole Polytechnique en 1920," 316-319; "Questions," 319-320.

**PROCEEDINGS OF THE ROYAL SOCIETY OF EDINBURGH**, volume 40, part 1, January, 1920: "Notices of fellows . . . recently deceased" [E. C. Fisher; Lord Rayleigh, J. W. Strutt; J. M. Bernard], 1-2.

**RENDICONTI DEL CIRCOLO MATEMATICO DI PALERMO**, volume 44, no. 1, January-April, 1920: "The foundations of the elliptic functions" by H. Hancock, 87-102.

**REVUE DE L'ENSEIGNEMENT DES SCIENCES**, volume 14, March-April, 1920: "Sur le sens de la variation d'une fonction" by G. Fontené, 49-53; "Sur l'ensemble de deux équations et la fraction rationnelle du second degré" by J. Juhel-Rénoy, 53-60; "Perpendiculaire menée d'un point sur une droite" by J. Lemaire, 60; "La fonction exponentielle et les fonctions circulaires" by C. Michel, 61-84; "Examens et concours de 1919," 84-91; "Problèmes de mathématiques donnés au baccalauréat en juillet 1919," 91-96—May-June, 1920: "Première leçon sur les séries entières" by P. Flamant, 97-107; "Note de géométrie" by R. Malloizel, 107; "Sur les orbiformes" by C. Bioche, 108-110; "Sur les ovales de Descartes" by R. Bérard, 110-119; "Sur le développement d'un cône et les points d'inflexion de la transformée d'une courbe tracée sur le cône" by R. Bérard, 119-121.

**REVUE DE MATHÉMATIQUES SPÉCIALES**, volume 13, no. 9, June, 1920: "Sur la folium double" by G. Loria, 201-202; Solutions of questions in analytic geometry, algebra and analysis, mechanics, 203-207, 213-220; "Sujets de concours, agrégation des sciences mathématiques, session spéciale d'octobre, 1919," 210-213.—No. 10, July: Solutions of questions in analytic geometry, mechanics, calculus, analysis, 225-233, 238-243; "Ecole Normale Supérieure et Bourses de Licence, concours de 1919," 234-237.—No. 11, August: "Ecole Normale Supérieure et Bourses de Licence, concours de 1914," 249-257 [Solutions of problems by L. Simon]; "Sujets de concours, Ecole Polytechnique, 1920," 258-260; Sujets de concours, Ecole Navale, 1916 et 1917, 268-272.

**REVUE GÉNÉRALE DES SCIENCES**, volume 31, June 30, 1920: "Charles Ange Laisant (1841-1920)" by J. Boyer, 397-398—August 15-30, 1920: "Les relations entre la science et l'industrie et les sociétés de perfectionnements industriels" by R. d'Adhémar, 513-519.

**SCIENCE**, new series, volume 52, July 23, 1920: "The structure of the universe" by W. D. MacMillan, 67-74—August 6: "A priori use of the Gaussian law" by E. G. Boring, 129-130—August 13: "Transverse vibrating rods" by A. G. Webster, 154; "Mathematische Zeitschrift" by G. A. Miller, 155—August 20: "Efficiency in thermal calculations" by A. W. Forbes and A. G. Webster, 175-176; Review by F. H. Garrison of C. Singer's *Greek Science and Modern Science* (Oxford Univ. Press, 1920), 178-179—September 3: Review by F. H. Garrison of D. W. Singer's *Hand-List of Scientific Manuscripts in the British Isles dating from before the sixteenth century* (London, 1919) and *Survey of Medical Manuscripts in the British Isles dating from before the sixteenth century* (London, 1920), 216-227—September 10: "The internal constitution of the stars" by A. S. Eddington, 233-240 [Address before the mathematical and physical section of the British Association for the Advancement of Science]—September 17: "Galileo's experiment from the leaning tower" by E. A. Partridge, 272-273—September 24: "The national committee on mathematical requirements," 289—October 1: "Electricity and gravitation" by H. Bateman, 314-315.

**SCIENTIFIC MONTHLY**, volume 11, September, 1920: "Giant suns" by H. H. Turner, 228-234; "A simplified musical notation" by E. V. Huntington with an introduction by A. T. Davison, 276-283 [First sentences of the article: "The purpose of this paper is to present a new musical notation which, while retaining all the excellent features of the present notation, would, it is believed, greatly simplify the processes of reading, studying and composing musical scores.

"The plan is not one of the artificial mnemonic devices of which the literature is full, but is based directly on the fundamental principle of music, namely, the equi-tempered scale. This scale, introduced by J. S. Bach about two centuries ago, and now dominating all musical composition, makes use of only twelve notes in each octave, these twelve notes dividing the octave into twelve mathematically equal intervals, called semi-tones. Now, if we draw an ordinary five-line staff with one ledger line, we see that exactly twelve notes can be accommodated on the lines and spaces of such a staff. What is then more natural than to assign one place on the staff to each of the twelve notes of the scale, thus doing away with all 'sharps' and 'flats,' and representing every musical interval correctly to the eye as well as to the ear? This, in brief, is precisely the plan here proposed."]

**TRANSACTIONS OF THE AMERICAN MATHEMATICAL SOCIETY**, volume 21, no. 3, July (published in October), 1920: "On the representation of a number as the sum of any number of squares, and in particular of five" by G. H. Hardy, 255-284; "A memoir upon formal invariancy with regard to binary modular transformations. Invariants of relativity" by O. E. Glenn, 285-312; "Properties of the subgroups of an abelian prime power group which are conjugate under its group of isomorphisms" by G. A. Miller, 313-320; "On the order of magnitude of the coefficients in trigonometric interpolation" by D. Jackson, 321-332; "Concerning simple continuous curves" by R. L. Moore, 333-347; "On the iteration of rational functions" by J. F. Ritt, 348-356.—October: "Minima of functions of lines" by Elizabeth Le Stourgeon, 357-383; "Invariants of infinite groups in the plane" by E. F. Simonds, 384-390; "On triply orthogonal congruences" by J. B. Shaw, 391-408; "A set of properties characteristic of a class of congruences connected with the theory of functions" by E. J. Wilczynski, 409-445; "On the equilibrium of a fluid mass at rest" by J. W. Alexander, 446-450; "Concerning approachability of simple closed and open curves" by J. R. Kline, 451-458.

**ZEITSCHRIFT FÜR MATHEMATISCHEN UND NATURWISSENSCHAFTLICHEN UNTERRICHT**, volume 51, no. 6, published June 15, 1920: "Zur Erfindung des Zeichens  $\times$ " by H. Wieleitner, 145-148; "Optische Geometrie" by R. Böger, 148-164; "Kleine Mitteilungen," 164-167; "Bücherbesprechungen," 167-169.